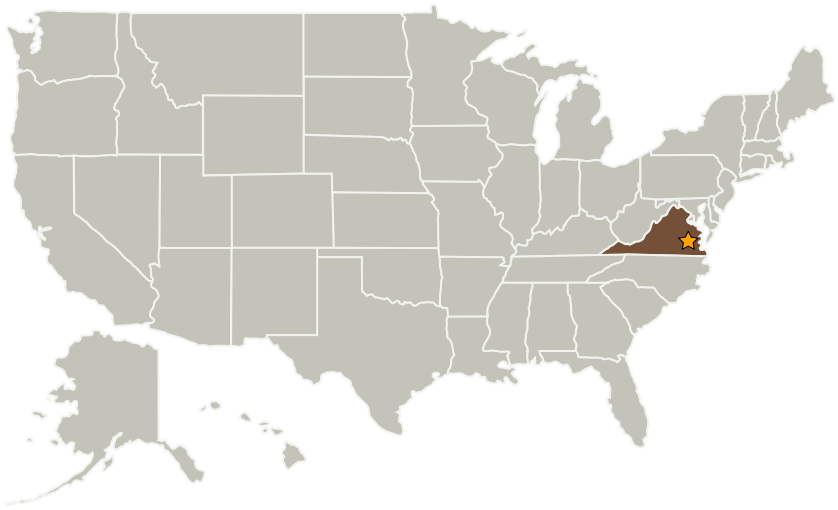
Ultraefficient Themoelectric Devices, Phase I

Completed Technology Project (2009 - 2010)

Project Introduction

Thermoelectric (TE) devices already found a wide range of commercial, military and aerospace applications. However, at present commercially available TE devices typically offer limited heat to electricity conversion efficiencies, well below the fundamental thermodynamic limit, calling for the development of higher efficiency materials. The team of MicroXact Inc and UCLA DRL is proposing to develop a revolutionary ultrahigh efficiency thermoelectric material fabricated on completely new fabrication principles. The material comprises the three-dimensional "wells" of Ge/Si Quantum Quantum Dot Superlattices fabricated by a conformal coating of macroporous silicon (MPSi) pore walls. Such a material will provide very high ZT values at macroscopic thicknesses of the material, permitting 30% or more conversion efficiencies. In Phase I of the project the team will develop a thorough model of the proposed TE material, will theoretically predict the achievable efficiency of the material and will demonstrate the growth of the single layer of QDs on the pore walls. In Phase II the team will fabricate the proposed material and will demonstrate the efficiencies exceeding 30%. After the Phase II the team will attract VC funding to commercialize the technology.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Langley Research Center (LaRC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★Langley Research Center(LaRC)	Lead Organization	NASA Center	Hampton, Virginia
MicroXact, Inc.	Supporting Organization	Industry	Radford, Virginia

Primary U.S. Work Locations
Virginia

Project Transitions

January 2009: Project Start

January 2010: Closed out

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Paul F Hines

Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.1 Materials
    - TX12.1.6 Materials for Electrical Power Generation, Energy Storage, Power Distribution and Electrical Machines